Opening Editorial:

Contemporary challenges and opportunities of doing business in Africa: The emerging roles and effects of technologies

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Abstract

The rapid advancement of technologies is one key factor propelling the current pace of global business. Technology is also playing an undeniable role in driving business opportunities and growth in developing countries. In this context, Africa is emerging at the forefront in contemporary debates about the adoption and adaptation of new and old technologies. Despite these developments, there is limited research on how emerging technologies have influenced contemporary challenges and opportunities with respect to businesses in Africa. This special issue sought to elicit insightful articles that reveal how technology development, adoption and adaptation are shaping businesses in Africa.

Background and motivation for the special issue

Much of the literature generated over the last few decades suggests that there is a strong link between technology, innovation and economic development (Nelson and Winter, 1982; Romer, 1990; Mokyr, Vickers, and Ziebarth, 2015). Over the past half of a century, the accelerated pace of globalisation coupled with technological breakthroughs have ushered in a new era of global competition and new roles of technology (Afuah, 2009; Narula, 2014). A noticeable trend is the shift towards investment in new and emerging technology by firms and governments as a means of creating conditions for local innovation, and the flourish of local firms (White and Bruton, 2011) in order to enhance their global competitiveness and survival. In particular, technology now plays a highly significant role in fostering economic development and entrepreneurship in

many emerging economies (The Economist, 2015). A growing body of knowledge suggests that technology has potential to unlock the potential of African industries and foster entrepreneurial development. It has also been suggested that new technologies are creating conditions for emerging indigenous firms to thrive (The Economist, 2015) giving social innovation programmes the capacity to enhance economic development in Africa. Although countries in Africa have generally lagged behind technologically (Osabutey *et al.*, 2014), new technologies provide the opportunity for leapfrogging in different sectors of the economies of these countries (Amankwah-Amoah, 2015, 2016). One of the distinctive features of the 21st century Africa has been a more visible role for new technologies. Adopting and utilizing latest technologies are key elements in Africa's ability to leap forward in the 21st century (World Development Report, 2016).

We know from existing research that governments in Africa are increasingly deploying their limited resources to identify and utilise technologies that can help improve decision-making and wider public policy (Amankwah-Amoah and Sarpong, 2016). The role of foreign firms as a major source of technology transfer is also established (Danquah and Amankwah-Amoah, 2017; Osabutey et al., 2014). Notwithstanding, considerable government involvement is required to enhance technology adoption, among other things, by promoting national identification, societal involvement and improving educational infrastructures (Galang, 2012). However, the expected role of government has not been significant in Africa because of policy lacuna (Osabutey and Debrah, 2012). Government policy should potentially chart technology and innovation trajectories that would contribute to economic development. This is where Africa, unlike other regions of the world such as South-East Asia, apparently lags behind. Engendering state driven technology development is lacking in Africa (Osabutey et al., 2014) and there is the need for academic contribution to this debate.

There is growing entrepreneurship and innovation in Africa (Egbetokun et al, 2016; Robson, Haugh, and Obeng, 2009). This has been characterised by the adoption of new technologies by small-medium enterprises (SMEs). Although there has been remarkable use of mobile technology, for example, by many SMEs in rural and urban Africa not much literature has been generated to enhance our understanding of the nuances involved. Indeed, anecdotal evidence suggests that whilst some challenges continue to exist some firms are, remarkably, taking advantage of new technologies. Nevertheless, the continent still faces challenges of human capital development and technology transfer (Osabutey et al, 2014) required to create conditions necessary to promote entrepreneurship and innovation whilst at the same time enabling the high-tech sector to flourish. This requires boosting human capital development through investments in education and training as well as linking universities, research institutes and industry to create the enabling environment for more local innovations to thrive (Osabutey and Debrah, 2012). However, there is need for context-relevant research that will inform the design of effective policies and programmes to achieve these.

There is a specific technological paradigm that has created significant opportunities for business creation and development in Africa: mobile telephony. Coupled with improved internet connectivity, mobile technologies have unleashed new opportunities for existing and aspiring entrepreneurs in the technology sector and beyond (see also Searcey, 2017). Indeed, the number of mobile subscriptions in Africa is around one billion and projected to reach 1.33 billion by 2021 (Reed, 2016) and thereby providing promising opportunities for nations and firms to develop and build service delivery systems that harness mobile technologies. Many new retailers, suppliers and distributors—some of whom take advantage of 'two-sided' markets[1] enabled by communication technologies—have emerged in the high-tech sector. In the wake of

[1] Here we imply the independent existence of demand and supply markets. An emergent business model that exploits this opportunity is the 'matching' business where an entrepreneur creates a platform that connects demand to supply and vice-versa. The best known examples are Uber and Airbnb. Less known but highly successful examples on the African continent include Jobberman, Hotels.ng and Andela.

poor phone networks, many individuals and entrepreneurs have turned to using WhatsApp and Skype to manage their businesses whilst concurrently reducing the cost of doing business. In addition, some entrepreneurs have taken to social media platforms such as WeChat, LinkedIn, Facebook and Twitter to not only advertise their businesses, but also gain publicity for their businesses. In addition, mobile money, where individuals use mobile phones for financial transactions including money transfer has also gathered momentum (Amankwah-Amoah, 2017). However, knowledge constraint, especially lack of information on technology, and poor infrastructure remain major barriers to firm-level innovation and knowledge search on the African continent (Adeyeye et al, 2018).

Against this background, and in light of limited scholarship on the nuanced nature of the role of technologies in businesses across Africa, this special issue aggregates the latest research on different aspects of how technology plays a role in the African business context. The papers in this issue address issues related to technology transfer, technology adoption, technology exploitation, institutional constraints, and characteristics of the business environment, among others. In general, the papers provide rich policy implications on how to harness technology for innovation and entrepreneurship on the African continent.

Overview of the issue

This special issue (SI) attracted numerous innovative contributions that adopt widely varied methodological approaches, ranging from detailed case studies to microeconometrics. The geographical coverage of the selection of articles is also rich: from single country cases in the East and West of Africa, to multi-country studies spanning the entire continent. The papers all help in addressing the main objective of the special issue, i.e., examining how technology affects the opportunities and challenges of doing business in Africa. We have a selection of papers on innovation and harnessing technology to power development. It is noteworthy that we

elicited a large number of strong research articles on information and communication technologies (ICTs). This goes to underscore the fact that ICTs have potentially strong implications for business planning and practice globally, including in sub-Saharan Africa.

Technology Transfer, adoption of technology and the efficiency of nations: Empirical evidence from sub Saharan Africa by Michael Danquah sets the tone with a multi-country analysis of the role of technology transfer and absorption in the efficiency of sub-Saharan African countries over a 30-year period. In the words of the Danquah, "national efficiency is the process whereby an economy is able to adopt and adapt already existing technology from world technology leaders and successfully apply it domestically." In other words, a country can be deemed as efficient or otherwise depending on how well its domestic economic agents, notably firms, can exploit foreign technologies. Interestingly, the empirical results in this paper suggest that neither human capital nor relative research and development (R&D) has an independent effect on national efficiency. This is striking because of the overwhelming evidence in the existing literature that both firm-level and national absorptive capacities—often reflected in human capital and R&D—directly affect technology absorption. This paper offers novel evidence indicating that the effects of human capital and R&D on national efficiency are respectively moderated by trade openness and machinery imports, at least in sub-Saharan Africa.

Zooming in on a specific technology, that is, mobile phones, the paper *Mobile phones, Institutional Quality and Entrepreneurship in Sub-Saharan Africa* studies how technology can affect the relationship between governance and the business environment in Africa. The paper establishes that diffusion of mobile phones in a country moderate the effects of the political, economic and institutional aspects of governance on the ease of doing business. For instance, when mobile phones are more widely diffused, good governance has a stronger positive effect on the cost of starting a business, the time required to build a warehouse and the time taken

resolve insolvency. The mechanism behind this effect is the ability of mobile phones to mitigate information asymmetry between entrepreneurs and government institutions. A stark implication of this result is that the diffusion of mobile phones in Africa not only directly creates business opportunities; it also helps in indirectly overcoming challenges to doing business.

Constructing a strategy on the creation of core competencies for African companies by Shenxue Li, Timothy Clark and John Sillince introduces a new conceptual framework on the development of core competencies in African firms. The authors' point of departure is the argument that perfunctory technology transfer cannot drive firm-level competence, despite the conventional wisdom that international technology transfer provides a mechanism for developing competitive advantage in developing country firms. The paper draws on the resource-based view and knowledge management literatures to discuss how firms manage knowledge and how this connects to the development of inimitable, rare and unique resources which could then be exploited to create value. In practical terms, this implies that technology transfer strategies in African firms need to be driven by capability development. A new technology that does not help to create new capabilities will create more challenges than opportunities.

A comparative study of appropriateness and mechanisms of hard and soft technologies transfer by David Botchie, David Sarpong and Jianxiang Bi builds upon the foregoing article by examining not just the mechanism by which technological artefacts are transferred into African firms but also the appropriateness of the artefacts. The authors also analyse the 'soft' components that accompany such technological artefcats, and which form the basis for capability development, and determine whether or not the new technologies will be effectively exploited. The research focused on Uganda, a land-locked African country where cotton plays an important economic role. Comparing the appropriateness and pro-poor nature of Indian and

US made hard and soft ginning technologies transferred into Uganda, the authors found that a technology transferred into a developing economy can only be appropriate if it is holistically (that is, including both the hard and soft components) transferred. In general, no one technology can perfectly fit into a context for which it was not originally developed, however, the successful transfer of the associated tacit knowledge with a technological artefact can make or mar its effective assimilation in a new context.

In *Value capture and value creation: The role of information technology in business models for frugal innovations in Africa* by Rachel Howell, Cees van Beers and Neelke Doorn, the facilitating role of information technologies (IT) in frugal innovation is examined. Drawing upon the business models and Bottom-of-the-Pyramid (BoP) innovation literatures, the authors identify three attributes of IT that support frugal innovation: it reduces transaction costs, has become cheaper, its positive externalities have increased considerable in recent years. The paper then illustrates how these attributes enhance technology diffusion with the case of a high-technology, low-cost weather sensor system deployed in sub-Saharan Africa. It is shown that IT has played a strong part in diffusing new innovations in Africa, but also comes with the potential to exclude certain groups. Overcoming the problem of social exclusion that could accompany technology adoption is indeed a fruitful avenue for further research.

The pervasive influence of technology on Africa's business sector is exemplified in the paper *ICT adoption in road freight transport in Nigeria – A case study of the petroleum downstream sector by* Abiye Tob-Ogu, Niraj Kumar and John Cullen, which focuses on how local and firm-level contextual factors constrain technology adoption and adaptation. The study context is road freight in the downstream sector of Nigeria's petroleum industry. Based on multiple key informant interviews in 10 firms, the paper shows among other things, that technology adoption has an inverted U-shaped relationship with firm size. Moreover, insight on the influence of

contextual factors on ICT use is useful for developers and original equipment manufacturers (OEMs) in creating relevant innovations.

Similar to *Mobile phones, Institutional Quality and Entrepreneurship in Sub-Saharan Africa*, the paper *Mobile Phone Adoption in Agri-food sector: Are Farmers in Sub-Saharan Africa Connected?* by Ronald Kabbiri; Manoj Dora; Vikas Kumar; Gabriel Elepu; Xavier Gellynck - also focuses on mobile phones. The sectoral focus is however different: dairy farmers in Uganda. This study applies a modified version of the well-known technology acceptance model (TAM) to study the adoption of mobile phones among these farmers. By so doing, the study fills a gap in the literature on mobile phone adoption, wherein the agricultural sector has hardly ever been studied. Empirically, the paper demonstrates that mobile phones can indeed be applied also in farming, in addition to normal communication. This is interesting in the face of rising application of mobile phone networks in solving problems within agricultural value chains. For instance, the middleman problem was eliminated in the distribution of fertilizers to Nigerian farmers with the help of a platform driven by mobile phones. In other African countries, small businesses are emerging to connect farmers to market via mobile phones.

In spite of this optimistic picture, it must be noted that cross-country dissimilarities could cause some countries to be more successful, or at least achieve more success in less time, than others in exploiting ICTs for business sector development. This is the thrust of *The (non-)emergence of mobile money systems in Sub-Saharan Africa: A comparative multilevel perspective of Kenya and Nigeria by* Jan Lepoutre and Augustina Oguntoye. The subject of the paper is the highly successful M-Pesa, a mobile money transfer system of Kenyan telecommunications operator Safaricom. M-Pesa has received wide acclaim for being both the first and most rapidly diffused mobile money in Africa, possibly also globally. An important explanation for the success of M-Pesa is the transformational effects it has on a large fraction of the Kenyan population which is

excluded from conventional banking services. Most African countries share this demographic problem, but have not experienced similar success in the diffusion of mobile money transfer systems. This paper sheds light on the mechanisms that explain these differences by comparing Kenya and Nigeria, two countries that are similar in many respects but are dissimilar in their adoption of mobile money. The authors find that network externalities from a critical mass of user and agent networks contributed to a mass adoption of mobile money in Kenya. The development of these networks has been facilitated by favourable institutional and industrial conditions which are underdeveloped in Nigeria. Thus, attaining similar adoption rates in Nigeria as in Kenya will take much longer, though it may eventually happen.

"Hub" organisations in Kenya: What are they? What do they do? And what is their potential? by David C. Littlewood and Wilkister L. Kiyumbu expatiates on one of the features of the Kenyan business ecosystem that deepens the effects of technology on businesses. In the last decade, hub organizations, that is, those that create a meeting point and development space for entrepreneurs, venture capitalists and knowledge creators, have multiplied across Africa. Although there are over 300 such facilities across the continent, more work is needed to build their innovative capacity (The Economist, 2017). Kenya has been a leader in this space, hosting the earliest, largest and arguably the most prominent hub organizations in Africa. However, hub organisations and the new dynamic organisational that they represent are poorly understood. Drawing upon in-depth qualitative studies of three hubs in Kenya, this paper analyses the nature of hubs in Kenya, unpacks their functions especially as intermediaries, and evaluates their potential notably including as promoters of entrepreneurship, innovation and wider positive social change.

Opportunity or Necessity? Conceptualizing Entrepreneurship at African Small-Scale Mines by Gavin M. Hilson, Abigail Hilson and Roy Maconachie, is the first of a set of articles that deals

more with small- and medium-sized enterprises and innovation. This article critically examines whether the policy environment in sub-Saharan Africa creates a friendly environment for low-tech, labour-intensive mineral extraction and processing to evolve as entrepreneurs. The authors highlight the Africa Mining Vision (AMV), a 2009 policy agenda adopted by African heads of state. A major objective of this vision is to boost artisanal and small-scale mining by following a series of streamlined recommendations. However, there is a dis-connect between the textbook view of entrepreneurship its real-life form. Bridging this disconnect remains an important task for policy if entrepreneurship generally, and in artisanal small-scale mining especially, will have transform economies in sub-Saharan Africa.

In *Drivers of eco-innovation in the manufacturing sector of Nigeria* by Maruf Sanni, the determinants of eco-innovation in the manufacturing sector of one of Africa's largest manufacturing sectors are analysed. The author notes the prevalence of electricity generation through diesel-powered plants with implications for cost of production and greenhouse gas emissions. This is in spite of rising global concerns about climate change, and the recognized role of eco-innovative manufacturing firms to decouple economic growth from excessive resource use and environmental pressure. Against this background, the paper sheds light on what characterizes firms that currently eco-innovate, with a view to making recommendations on how to enhance firms' green competitive advantage in a latecomer economy. The paper relies on data from the Nigerian innovation survey, and finds that innovative organizational strategies, the need to meet regulatory standards and access to formal sources of knowledge are major drivers of eco-innovation. Yet, the determinants of both products and process eco-innovations are heterogeneous.

Innovation and productivity in formal and informal firms in Ghana by Xiaolan Fu, Pierre Mohnen and Giacomo Zanello contributes to the thin literature on innovation in informal firms

in sub-Saharan Africa. Despite its relevance for economic policy, the link between innovation and firm-level remains under-studied in Africa, particularly among informal firms. This paper applies a revised version of the popular Crépon-Duguet-Mairesse (CDM) structural model to a large firm-level dataset of manufacturing firms in Ghana, which includes both formal and informal firms. This attribute of the data allows a comparison of formal and informal firms in terms of how innovation affects productivity. The results show that innovation, especially technological innovation, positively impacts labour productivity. Strikingly, while formal firms are not necessarily more productive than informal firms, they experience a larger effect of innovation on productivity. This result echoes the recent development economics and public policy literatures on the economic virtues of formality even in latecomer contexts where the informal sector is disproportionately large (see, for instance, LaPorta and Shleifer, 2014 and Olofinyehun et al, 2017).

The foregoing is further supported in the final paper in this issue, *The Effect on Innovation of Beginning Informal: Empirical Evidence from Kenya* by Pedro Mendi and Robert Mudida. The paper studies the long-run effects of initial informality on a firm's innovative activities and on the importance of obstacles to innovation. Using data from an innovation survey in Kenya, the paper reports a persistent negative effect of past informality on technological innovation, especially process innovation. Moreover, beginning operations in the informal sector negatively affects a firm's perceptions on the need to innovate, suggesting that relative to those that start out formally, firms which begin in the informal sector face severe informational disadvantages even after they transition into the formal sector.

Conclusion

This special issue brings together a rich mix of recent research that contributes towards filling an important gap in the entrepreneurship and innovation literature in Africa. These papers range

from detailed case studies to microeconometric exercises, and include single country cases as well as multi-country studies traversing the entire continent. It is instructive to note that the large number of studies on information and communication technologies (ICTs), which underscores the strong implications this technology has for the African business landscape. Taken together, the articles in this special issue advance the research agenda on the role of technology in creating opportunities and challenges for business on the African continent.

The insight generated by the research included in this issue is wide and far-reaching. Globalisation and emerging technologies have increased business opportunities in Africa, yet the adoption of technologies is nuanced by skills gaps and cost implications. Moreover, technological innovation influences labour productivity in both formal and informal firms with informal firms posting greater productivity increases. This highlights the importance of new technologies to the innovative capacities of the prevalent informal sector in Africa. SMEs in the informal sector in Africa have embraced technological innovations as a means of creating new opportunities as well as expanding their businesses. In particular, high mobile phone penetration has brought opportunities to SMEs in rural and urban areas, opportunities which were hitherto beyond their imagination. It is also suggested that technology adoption would require the involvement of state institutions to harness full potential for business growth and economic development. Suggestively, there is the need to improve technology development. Even though technology transfer is an option, institutional support is required to enhance technology flow and applications. Indeed, technology transfer is necessary but not sufficient to create the core competencies required by companies in Africa to take full advantage of the opportunities new technologies bring. It is our hope that this issue will spur a fresh wave of inquiry into the role of technology in entrepreneurship in Africa.

References

Adeyeye, D., Oluwatope, O. B., Egbetokun, A., Sanni, M. and Opele, J. K. (2018), How barriers influence firms' search strategies and innovative performance. *International Journal of Innovation Management* **22**(2). DOI: 10.1142/S1363919618500111.

Afuah, A. (2009). *Strategic innovation: new game strategies for competitive advantage*. Routledge, New York.

Amankwah-Amoah, J., 2015. Solar energy in sub-Saharan Africa: The challenges and opportunities of technological leapfrogging. *Thunderbird International Business Review*, 57(1), 15–31.

Amankwah-Amoah, J. (2016). The evolution of science, technology and innovation policies: A review of the Ghanaian experience. Technological Forecasting and Social Change, 110, 134–142.

Amankwah-Amoah, J., Sarpong, D., 2016. Historical pathways to a green economy: The evolution and scaling-up of solar PV in Ghana, 1980-2010. *Technol. Forecast. Soc. Chang*. 102, 90–101.

Bruton, G.D., Ahlstrom, D., Obloj, K., 2008. Entrepreneurship in emerging economies: Where are we today and where should the research go in the future. *Enterp. Theory Pract.* 32(1), 1–14.

Danquah, M., and Amankwah-Amoah, J. (2017). Assessing the relationships between human capital, innovation and technology adoption: Evidence from sub-Saharan Africa. Technological Forecasting and Social Change, 122, 24-33

Egbetokun, A., Atta-Ankomah, R., Jegede, O. and Lorenz, E. (2016) Firm-level innovation in Africa: overcoming limits and constraints, Innovation and Development, 6:2, 161-174

Galang, R.M.N. (2012), 'Government efficiency and international technology adoption: the speed of electronic ticketing among airlines', *Journal of International Business Studies*, 43 (7), 631-654.

La Porta, R., and Shleifer, R. (2014). 'Informality and Development', Journal of Economic Perspectives, 28(3): 109–26.

Mokyr, J., Vickers, C., and Ziebarth, N.L. (2015), 'The history of technological anxiety and the future of economic growth: Is this time different?', *Journal of Economic Perspectives 29(3)*, 31-50.

Narula, R. (2014). Globalization and technology: Interdependence, innovation systems and industrial policy. John Wiley and Sons.

Nelson, R. and Winter, S.G. (1982), '*An Evolutionary Theory of Economic Change'*. Harvard University Press, Cambridge.

Olofinyehun, A. O., Adelowo, C. M. and Egbetokun, A. A. (2017), The supply of high-quality entrepreneurs in developing countries: evidence from Nigeria, *Science and Public Policy* (in press). DOI: 10.1093/scipol/scx065

Osabutey, E. L., and Debrah, A. Y. (2012). Foreign direct investment and technology transfer policies in Africa: A review of the Ghanaian experience. *Thunderbird International Business Review*, 54(4), 441–456.

Reed, M. (2016). Africa to reach landmark 1 billion mobile subscriptions by end of 2016. https://www.ovum.com/press_releases/africa-reach-landmark-1-billion-mobile-subscriptions-end-2016/.

Searcey, D. (2017). The Connectivity Challenges of West Africa. New York Times, August 31, B6.

The Economist (2015). Technology in Africa: The pioneering continent. Apr 25th 2015

The Economist (2017). Hurdles for hubs. Vol. 423 Issue 9035, p55-56.

White, M. and Bruton, G. D. (2011). *The Management of Technology and Innovation: A Strategic Approach*. 2nd, Mason, OH: Thomson-Southwestern.

World Development Report (WDR), 2016. Digital dividends. Washington DC: World Bank